PTO 09-0857

CC=DE DATE=19960912 KIND=A1
PN=19608937

METHOD FOR MANUFACTURING A TAG SUBSTRATE
[VERFAHREN ZUM HERSTELLEN EINES MARKIERUNGSTRÄGERS]

Dieter Michel, et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. November 2009

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19):	DE
DOCUMENT NUMBER	(11):	19608937
DOCUMENT KIND	(12):	A1
PUBLICATION DATE	(43):	19961209
APPLICATION NUMBER	(21):	19608937.9
DATE OF FILING	(22):	19960308
ADDITION TO	(61):	NA
INTERNATIONAL CLASSIFICATION	(51):	G01B 3/02, G01D 13/12, G01B 21/00, B23K 26/00, G01D 13/00
PRIORITY	(30):	March 10, 1995[DE] 195085272
INVENTORS	(72):	MICHEL, DIETER; FRANZ, DR. ANDREAS and SPIES, ALFONS
APPLICANT	(71):	DR. JOHANNES HEIDENHAIN GMBH
DESIGNATED CONTRACTING STATES	(81):	NA
TITLE	(54):	METHOD FOR MANUFACTURING A TAG SUBSTRATE
FOREIGN TITLE	[54A]:	VERFAHREN ZUM HERSTELLEN EINES MARKIERUNGSTRÄGERS

Description /1*

The invention relates to a method for manufacturing a tag substrate according to the preamble of Claim 1.

According to the state of the art, tag structures for a tag substrate are first created in photoresist using photolithography and then transferred in additional process steps (wet chemical etching, “liftoff,” etc.) to the tag substrate. However, naturally the exactness of the tag decreases with each additional process step.

The invention is based on the object of providing a method for manufacturing a tag substrate, by which a tag structure is created in the fewest possible process steps and by which the tags can be produced adequately, precisely in the form of a separating structure.

This object is achieved by a method according to Claim 1.

The invention will be described using exemplary embodiments with the help of drawings.

In the drawings:

Fig. 1 shows a tag substrate with tag layer;

Fig. 2 shows a tag substrate with polished surface and

Fig. 3 shows a tag substrate with grid structures that have substructures.

In the following examples, tags are created on a tag substrate in the form of separating structures, directly with the use of high-energy laser radiation, i.e. with a minimum of process steps. This method is fast enough for economical manufacturing of a final product. The duration

* Number in the margin indicates pagination in the foreign text.

of typical excimer laser pulses is so short, at approximately 20 ns, that exposure during movement is possible.

A manufacturing process that is possible in this way will be explained in the following. The suggestions relate to period grids and/or other suitable separating structures or tags.

Fig. 1 shows a tag substrate 11, which consists of a substrate S_1 and a tag layer T_1. The tag layer T_1 is highly reflective and the tag layer T_1 is a tag applied in the form of a separating structure TS_1. This illustration principle also applies to the following illustrations, in which the reference numbers are each appended to the illustration numbering as an index.

There are different structuring possibilities, of which in this change, the change in the surface to decrease the reflectivity according to the invention will be described.

With the use of high-energy radiation, the highly-reflective surface of a layer T_1 that can be used to make a tag is partially roughened. The tag layer T_1 is applied in the usual way as a gold layer on a steel strip as S_1 (see Fig. 1). However, the surface that can be used to make a tag can also be created directly on the substrate surface T_2, e.g. by polishing, which can be seen from the exemplary embodiment according to Fig. 2.

The high-energy radiation can be generated with the use of the previously mentioned excimer laser. For manufacturing the separating structure TS_1 or TS_2 in the form of a grid, the highly reflective surface of the gold layer T_1 or the polished surface T_2 of the substrate S_2 is melted with the use of short laser pulses with a duration of about 20

ns, after which, in the pulse pause, the surface T_1, T_2 immediately solidifies again. In order to prevent energy dissipation from the processing area during the duration of the laser pulse, pulses of a clearly shorter duration can be used. The solidified melt has a different roughness and thus different optical properties than the highly reflective surfaces T_1, T_2 and a separating structure TS_1, TS_2 with reduced reflectivity develops.

This effect of reduced reflectivity can be enhanced by an intentional sub-structuring of the individual structure on the order of magnitude of wavelength λ, which is schematically illustrated in Fig. 3 using a grid structure TS_3 of the tag. This sub-structuring can consist of periodic or statistically distributed patterns TS_{31}, TS_{32}, TS_{33}, as shown in the lower part of Fig. 3. The statistical distribution according to TS_{32} can occur using a suitable statistical function. This statistical function can be a so-called "random" function. However, the sub-structuring can also comprise periodic patterns like points TS_{31} or grid TS_{33}.

Claims

1. Method for manufacturing a tag substrate, in which the tags – preferably in the form of a separating structure (TS) for dimensional embodiment of a length or angle measuring device – are created using high-energy radiation, especially laser radiation, characterized by the process steps

- preparation of a substrate (S_1, S_2, S_3)
- creation of a surface that can be used to make a tag (T_1, T_2, T_3)

on the substrate (S_1, S_2, S3)

- partial melting of the surface that can be labeled (T_1, T_2, T_3) of the substrate (S_1, S_2, S_3) to create the label (TS_1, TS_2, TS_3)

- allowing the partial melt to solidify.

2. Method according to Claim 1, characterized in that the surface that can be labeled is created by polishing the substrate surface (T_2).

3. Method according to Claim 1, characterized in that the surface that can be labeled is created by applying a highly-reflective label layer (T_1, T_3) on the substrate surface.

4. Method according to Claim 1, characterized in that the partial melting is carried out with the use of radiation pulses with a pulse duration of ≤ 30 ns.

5. Method according to Claim 1, characterized in that a grid structure is created as the label (TS_1, TS_2, TS_3).

6. Method according to Claim 5, characterized in that a substructure (TS_{31}, TS_{32}, TS_{33}) is superimposed on the individual grid structures.

7. Method according to Claim 6, characterized in that the sub-structuring (TS_{31}, TS_{33}) is designed as a periodic pattern.

8. Method according to Claim 7, characterized in that the periodic pattern (TS_{33}) is designed as a grid.

9. Method according to Claim 6, characterized in that the sub-structuring (TS_{32}) is carried out according to a statistical function (random or pseudo-random). /2

10. Method according to one of the preceding claims, characterized in that the high-energy radiation is generated by an excimer laser.

----
1 Page(s) of drawings follows

FIG. 1

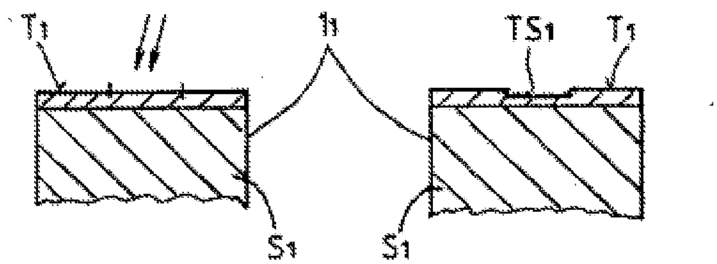

FIG. 2

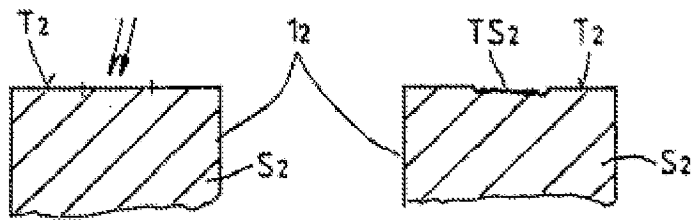

FIG. 3